Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An automated simulation method for determining enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the Dirac coulombic tunnelling integral, comprising the steps of:

assigning the variable C to the ratio of the Poole-Frenkel barrier lowering energy (ΔE_{fp}) divided by the energy range for which tunnelling can occur (ΔE_n);

assigning the value (C+1)/2 to a variable v and performing a second order Taylor's series expansion of the Dirac coulombic tunnelling integral around v to determine a maximum value (u_{max}) for the variable u of the integral;

determining if the value for u_{max} is less than C, is between C and 1 or is more than 1;

assigning the value of C to the variable v if u_{max} is less than C;

assigning the value of u_{max} to the variable v if u_{max} is between C and 1;

assigning the value of 1 to the variable v if u_{max} is more than 1;

reducing the Taylor's series expansion of the Dirac coulombic tunnelling integral to an error function;

reducing the error function to simple exponential functions by applying rational approximations to the error function; and

calculating the enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the said simple exponential functions;

wherein said method determines the leakage current in a polysilicon Thin Film Transistor.

2. (Currently Amended) An automated simulation method which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the approximated tunnelling equation set out as equation 26 herein;

wherein said method determines the leakage current in a polysilicon Thin Film Transistor.

3. (Currently Amended) An automated simulation method which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the approximated tunnelling equation set out as equation 27 herein;

wherein said method determines the leakage current in a polysilicon Thin Film Transistor.

4. (Canceled)

5. (Currently Amended) A simulator for determining enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the Dirac coulombic tunnelling integral, comprising:

means storing a variable C having a value equal to the ratio of the Poole-Frenkel barrier lowering energy (ΔE_{fp}) divided by the energy range for which tunnelling can occur (ΔE_n);

means which assign the value (C+1)/2 to a variable v and perform a second order Taylor's series expansion of the Dirac coulombic tunnelling integral around v to determine a maximum value (u_{max}) for the variable u of the integral;

means which determine if the value for u_{max} is less than C, is between C and 1 or is more than 1;

means which assign the value of C to the variable v if u_{max} is less than C;

means which assign the value of u_{max} to the variable v if u_{max} is between C and 1;

means which assign the value of 1 to the variable v if u_{max} is more than 1;

means storing simple exponential functions derived from applying rational approximations to an error function obtained by reducing the Taylor's series expansion of the Dirac coulombic tunnelling integral; and

means which calculate the enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device using the said simple exponential functions;

wherein said simulator determines the leakage current in a polysilicon Thin Film Transistor.

6. (Currently Amended) A simulator which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device comprising means which calculate the approximated tunnelling equation set out as equation 26 herein;

wherein said simulator determines the leakage current in a polysilicon Thin Film Transistor.

7. (Currently Amended) A simulator which determines enhanced generation recombination rate due to trap-to-band tunnelling in a semiconductor device comprising means which calculate the approximated tunnelling equation set out as equation 27 herein;

wherein said simulator determines the leakage current in a polysilicon Thin Film Transistor.

8-12. (Canceled)

13. (New) A semiconductor device manufactured based on the leakage current determined by the method of claim 1.

14. (New) A semiconductor device manufactured based on the leakage current determined by the method of claim 2.

15. (New) A semiconductor device manufactured based on the leakage current determined by the method of claim 3.

16. (New) A semiconductor device manufactured based on the leakage current determined by the simulator of claim 5.

17. (New) A semiconductor device manufactured based on the leakage current determined by the simulator of claim 6.

18. (New) A semiconductor device manufactured based on the leakage current determined by the simulator of claim 7.

19. (New) The method of claim 1, comprising manufacturing a semiconductor device based on the leakage current.

20. (New) The method of claim 2, comprising manufacturing a semiconductor device based on the leakage current.

21. (New) The method of claim 3, comprising manufacturing a semiconductor device based on the leakage current.

22. (New) The simulator of claim 5, comprising manufacturing a semiconductor device based on the leakage current.

23. (New) The simulator of claim 6, comprising manufacturing a semiconductor device based on the leakage current.

24. (New) The simulator of claim 7, comprising manufacturing a semiconductor device based on the leakage current.